Vertical profiles of water quality parameters at sampling stations in the South Atlantic Bight from 2015-2020 (SAB BMA project)

Website: https://www.bco-dmo.org/dataset/882177
Data Type: Cruise Results
Version: 1
Version Date: 2022-10-24

Project
» Groundwater sources of "new" N for benthic microalgal production in the South Atlantic bight (SAB BMA)

Contributors	Affiliation	Role
Pinckney, James L.	University of South Carolina at Columbia	Principal Investigator
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Abstract
Vertical profiles of depth, conductivity, salinity, temperature, pH, and dissolved O2 were measured on selected dates from 7 June 2018 to 10 August 2021 in nearshore shelf waters off Charleston, SC. The survey area was located in the region of 32° 42’ N, 79° 50’ W and 32° 51’ N, 79° 09’W. Profiles were obtained using a YSI 6820 sonde deployed by hand. These data were used to map the physical structure of the water column and assess inputs of groundwater effects on phytoplankton and benthic microalgae. Results may be of interest to others conducting research projects off Charleston, SC. Data were collected and interpreted by Jay Pinckney at the University of South Carolina, Columbia, SC.

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Coverage

Spatial Extent: **Lat**:32 **Lon**:-79
Temporal Extent: 2018-06-07 - 2021-08-10

Methods & Sampling

Methods & Sampling

Hand deployment of YSI 6810 sonde with measurements of water quality parameters at 1 m depth intervals to a maximum depth of 15 m.

Samples were taken from R/V Trinity, owned by a private charter company called Charleston SCUBA. This company is no longer in operation.

Data Processing Description

BCO-DMO Processing Notes:

- Reformatted the data table so that the there is one header row, and this row is the first row in the table
- Replaced column name spaces with underscores "_"
- Replaced special character "δ" with "Sigma"
- Rounded lat and long fields to 6 decimal places
- Rounded all depth values to 3 decimal places
- Standardized date time format to %Y-%m-%d %H:%M

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Data Files

File
bco-dmo_vertical_profiles_database-1.csv (Comma Separated Values (.csv), 54.91 KB) MD5:3626b9d28dae77b777be366e3a8f935f Primary data file for dataset ID 882177

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Related Publications

Pinckney, J. L., Zaunbrecher, S., Lang, S., Wilson, A., & Knapp, A. (2022). Seasonality of benthic microalgal community abundance in shallow shelf waters. Continental Shelf Research, 244, 104797. https://doi.org/10.1016/j.csr.2022.104797
Results

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Parameters

Parameter	Description	Units
Location	Sample location identifier	unitless
Cruise	Cruise identifier	unitless
Latitude	Latitude; positive values indicate a Northern coordinate	degrees North
Longitude	Longitude; negative values indicate a Western coordinate	degrees West
Date_Time	Date and time of location (Eastern Standard Time)	unitless
Temp	Water temperature	degrees C
Sal	Salinity	ppt
DO	Dissolved oxygen	mg/L
Depth	Sampling depth	mg/L
pH	Water pH	pH units
Sigma_t	Specific density	Relative units

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Instruments

Dataset-specific Instrument Name	YSI 6810 Multi-parameter Sonde
Generic Instrument Name	YSI Sonde 6-Series
Dataset-specific Description	Hand deployment of YSI 6810 sonde with measurements of water quality parameters at 1 m depth intervals to a maximum depth of 15 m.
Generic Instrument Description	YSI 6-Series water quality sondes and sensors are instruments for environmental monitoring and long-term deployments. YSI datasondes accept multiple water quality sensors (i.e., they are multiparameter sondes). Sondes can measure temperature, conductivity, dissolved oxygen, depth, turbidity, and other water quality parameters. The 6-Series includes several models. More from YSI.

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Project Information

Groundwater sources of "new" N for benthic microalgal production in the South Atlantic bight (SAB BMA)

Coverage: South Atlantic Bight (32 N, 79 W)

NSF Award Abstract:
Continental shelves are highly productive, with both ecological and economic importance. Benthic microalgae (BMA) are key primary producers in these location. As much as 6x the water column biomass of primary producers is compressed into a layer only a few mm thick on the sediment surface. The source(s) of fixed nitrogen (N) supporting such highly concentrated BMA biomass is currently unknown. Recent studies of sub-seafloor groundwater flow at the University of South Carolina have demonstrated that upwelling saline groundwater likely supplies high concentrations of nutrients in the ridge-swale habitats in the South Atlantic Bight (SAB). The investigators suggest that groundwater input of fixed N into surficial sediments is the primary source of N supporting BMA biomass and production in the mid-shelf region of the SAB. The purpose of this project is to determine the primary source of fixed N supporting BMA biomass in the surface sediments of the shallow shelf waters (<30 m), using the SAB as a field area. A secondary objective is to apply novel and innovative methods to directly quantify groundwater inputs of N into surficial sediments. Research results will fully document the spatio-temporal distributions of BMA and phytoplankton biomass and community structure in the mid-shelf region of the SAB and relate the observed patterns to groundwater inputs of fixed N sources as well as hydrographic and climatic conditions. This research will provide full support and tuition for 2 graduate students, summer support for undergraduate assistants, and involve upper level undergraduates as lab interns. The study team will also work with the Baruch Institute and other partners to develop an "Ocean Schoolyard" program to meet the needs of teachers, students, and community audiences. The project will also provide partial support for Girls Go for I.T., a coding summer camp designed to attract middle-school-aged girls to careers in I.T. and STEM fields.

The specific objectives of the study are to (1) quantify spatial and temporal variations in N fluxes associated with hydrodynamic exchange and upward groundwater flow (2) document spatial and temporal variations in BMA biomass and (3) measure the delta15N of fixed nitrogen sources (well water, porewater and water column ammonium and nitrate; sediments), the BMA, and phytoplankton. The sampling area will be restricted to the 10 - 30 m isobath region of the SAB off the coast of Charleston, SC. Samples will be collected at both the existing groundwater well field and other regions of the shelf. At each of the groundwater wells in the well field, SCUBA divers will collect fluids from the wells to determine well water inorganic nutrient concentrations (nitrate + nitrite, ammonium, orthophosphate, silicon) and the delta 15N of well water ammonium and nitrate (when present). In nearby sediments, samples will be collected for BMA biomass and community composition, surface porewater inorganic nutrients (nitrate + nitrite, ammonium, orthophosphate, silicon), C and N of sediments, sediment grain size analysis, and delta 15N of BMA, ammonium, nitrate (when present), and

sediments. Line transects, consisting of 5 sampling locations along a 50 m transect, will be conducted in each of the 4 depth strata. At 10 m intervals along each transect, divers will collect samples the same as above for the well field. Water column samples will be collected for HPLC measurements of phytoplankton biomass and community composition, inorganic nutrient concentrations (nitrate + nitrite, ammonium, orthophosphate, silicon), seston CHN, delta 15N of phytoplankton, and the delta 15N of ammonium and nitrate. The researchers will use heat as a tracer to map the depth of hydrodynamic exchange and monitor the rate of vertical groundwater flow. Results from that analysis will also allow them to then simulate transport of a conservative tracer that can be compared to observed nutrient concentrations to BMA abundance and community composition.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1736557

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